



Newsletter

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Director's Note

There is a tradition in academic institutions that at approximately seven-year intervals faculty members may take leave of their everyday administrative tasks, committee meetings, teaching assignments and so forth to concentrate fully on their research and scholarly work. During this "sabbatical"—a word with the same roots as "Sabbath", the seventh day of the week, and the day of rest—individuals typically spend from six months to a year pursuing their own research, be it laboratory, field or academic in nature. The opportunity to gain greater depth and broader experience that the sabbatical provides helps make them more effective scholars and teachers.

In 1996, three Institute ecologists took advantage of this opportunity. Dr. David Strayer was a Visiting Scholar in the Department of Biological Sciences at Ohio Northern University, Dr. Richard Ostfeld was a Visiting Scientist in the Department of Integrative Biology at the University of California, Berkeley, and I worked at my research site in New Hampshire.

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Dr. Likens' Sabbatical: Redbacks, Reflection and Research

Hubbard Brook Experimental Forest, New Hampshire. July 1996, 11 p.m.—It's dark and it's drizzling. Northern redback salamanders emerge from within and beneath rotting logs, from under rocks and from the leaf litter layered on the forest soil. They climb into shrubs, up tree trunks, over mosses and across leaf surfaces, looking for a meal of insects and other small invertebrates. Suddenly, a salamander becomes the hunted instead of the hunter: two rain-jacketed giants have trapped it in their flashlight beam. Gene and Phyllis Likens step back and record the sighting in their field notebook ...

This research project was one of several on which Institute of Ecosystem Studies' Director Likens focused during his recent sabbatical leave. From May through November 1996, he spent the bulk of his time at the Hubbard Brook Experimental Forest. It was there, in the White Mountains of New Hampshire in 1963, that he and three colleagues developed a research program called the Hubbard Brook Ecosystem Study (HBES). Now, the Hubbard Brook Experimental Forest is one of the most intensely studied landscapes on Earth.

During his seven months away from IES, Dr. Likens was able to concentrate on his writing and field work. One of the many long-term HBES research programs that

he has led is an investigation of the role of calcium in the forest ecosystem, and one of his writing projects while on sabbatical was completion of a monograph called *The Biogeochemistry of Calcium at Hubbard Brook*. There were 11 authors, including Dr. Gary Lovett and Mr. Donald Buso of IES, and it was Dr. Likens' challenge to bring all the contributions together in one scholarly report. The monograph now has been submitted for publication.

He also was able to do a great deal of hands-on field work. In summer 1995 he began the salamander study, with a focus on the northern redback salamander (*Plethodon cinereus*), to determine whether the population of these amphibians at the Hubbard Brook Experimental Forest has changed since he and one of his former Cornell University graduate students did a similar study 25 years ago. (Dr. Thomas Burton, now chairman of the Zoology Department at Michigan State University, was the student.) Dr. Likens is assisted in his current work by Phyllis Likens, his wife. An IES administrative assistant, Phyllis Likens has been the Hubbard Brook Ecosystem Study executive secretary for a number of years. The purpose of the project is to gather data to test the idea that there has been a widespread decline in amphibians.

continued on page 3



TYLER PRIZE/USC PHOTO

L. to r: Dr. F. Sherwood Rowland, Mrs. Phyllis Likens and Dr. Gene E. Likens at the Tyler Environmental Prize Pavilion Dedication in November. Dr. Likens and Dr. Rowland, who was a 1995 recipient of the Nobel Prize in Chemistry for his discovery that chlorofluorocarbons could destroy the stratospheric ozone layer, are past recipients of the Tyler Prize.

The International Appeal of IES: Part II

The Institute of Ecosystem Studies is increasingly a place for international collaboration in research and education. In the last issue of the IES NEWSLETTER, the cover story introduced visiting scientists from Spain and China. This issue profiles two scientists from Brazil who are working with IES ecologists for a year.

Testing a Model for Algae in Lakes

Limnologist Dr. Vera L.M. Huszar wanted to work at an institution where she could improve her research by collaborating with experts in her field, the study of freshwater ecosystems. An adjunct professor of botany at the Universidade Federal do Rio de Janeiro, Brazil and an expert on phytoplankton ecology and taxonomy, Dr. Huszar had become familiar with the work of IES scientists through their papers in the scientific literature. She met Dr. Likens in July 1995 at the 26th Congress of the International Association for Theoretical and Applied Limnology in São Paulo where she started to make plans for her 1997 visit. A fellowship from the Brazilian Government, which has programs to improve the qualifications of university professors, is supporting her work here.

Phytoplankton are microscopic "plants" suspended in water of lakes and oceans. They are diverse, found in seven botanical divisions, or phyla, in three kingdoms (Monera, Protista and Plantae). In fact, they are more diverse genetically than all terrestrial plants combined. This genetic diversity is associated with a great deal of diversity in size, growth form, toxicity and nutrient content. These factors in turn have an impact on food web transfers, biogeochemical cycles, aesthetics and

even, in some cases, human health. Thus, it is important to understand the environmental conditions that select for different phytoplankton communities.

Phytoplankton communities in lakes are extremely variable, depending on nutrient chemistry, the trophic state, and physical parameters such as the rate of water flushing and the frequency of mixing of the water layers. The Reynolds' Habitat Template, developed by Dr. Colin S. Reynolds at the Institute of Freshwater Ecology in England, is a model that attempts to explain this variation. The model considers how algal populations increase over time, how morphological and behavioral adaptations are differentially selected and how populations are assembled. Dr. Huszar's work at IES is aimed at testing this model.

Dr. Huszar is working with IES biogeochemist Dr. Nina Caraco, studying phytoplankton from six lakes ranging from an oligotrophic, or non-productive, state, to a eutrophic, or productive, state. The lakes are: Mirror Lake in the Hubbard Brook Experimental Forest in New Hampshire; Ellsworth Pond, near Hubbard Brook; Lake Wononskopolomuc in Lakeville, Connecticut; and, in New York, Chodikee Lake, near West Park,

Stissing Lake in Pine Plains, and Mohonk Lake in New Paltz. For these lakes, many of the physical and chemical variables thought to control phytoplankton have been measured previously as part of work by Dr. Caraco and Dr. Jonathan Cole on carbon dioxide and phosphorus dynamics. Samples for measuring these chemical variables, along with phytoplankton samples, were collected by IES research assistants Rich Miller and Peter Raymond.

Dr. Huszar is analyzing the phytoplankton samples from each lake, counting and identifying the functional groups in relation to the seasonality and environmental attributes. If the relationship between the dynamics of the community and the physical and chemical environmental variability is strong, she hopes to be able to predict the assemblages of species and develop approaches for environmental management.

At home, Dr. Huszar studies phytoplankton ecology in coastal lagoons, in small reservoirs and in an Amazonian floodplain lake that receives tailings from a bauxite mine. Her work at IES will help her expand the field of limnology in Brazil.

What Controls Bacterial Growth in the Hudson River?

Dr. Fábio Roland is an ecologist at the Juiz De Fora Federal University in the mountainous Juiz De Fora Province of Brazil. Also supported by a fellowship from the Brazilian Government, he is working with aquatic microbiologist Dr. Jonathan Cole to learn what environmental factors control bacterial growth efficiency in the Hudson River.

Bacteria play an integral role in aquatic ecosystems. From the point of view of the carbon cycle, bacteria are catalysts for two very different kinds of reactions. By the process of respiration, bacteria oxidize organic matter, converting it to carbon dioxide and water. By the process of growth, bacteria incorporate organic matter in the environment into their own tissues. In aquatic ecosystems, the major pool of organic matter is in the form of compounds dissolved in the water. This



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In an IES laboratory, Dr. Fábio Roland tests Hudson River water samples to learn more about factors that affect bacterial growth efficiency.

continued on following page

International Appeal, *from page 2*

dissolved organic carbon (DOC) is unavailable to higher organisms, but bacteria can utilize it. Thus, the portion of the DOC that goes into bacterial growth may become available to the consumers of bacteria (protozoa and small zooplankton) and this DOC is "recovered" back into the food web. The portion of the DOC that is respired by bacteria is lost forever from the ecosystem. Bacterial growth "links" DOC to the rest of the food web; bacterial respiration is a "sink" of this DOC.

Microbial ecologists talk about the processes of bacterial growth and respiration in terms of bacterial growth efficiency, or BGE. In essence, BGE is the ratio of bacterial growth to bacterial respiration. If BGE is high, it means that a large portion of the DOC utilized by bacteria goes into growth and is therefore available to the rest of the food web. If BGE is low, it means that most of the DOC utilized by bacteria is respired and little is available to the rest of the food web. While microbial ecologists routinely measure bacterial

growth, bacterial respiration rarely is measured. From the studies that exist (recently reviewed by IES postdoctoral associate Dr. Paul del Giorgio *et al.*; see Vol. 13 No. 6 of the IES NEWSLETTER), we do know that BGE varies widely both among and within aquatic systems but we do not yet know the factors that cause BGE to vary. Dr. Roland is conducting experimental studies of what controls BGE in the Hudson River.

With IES research assistant David Fischer, he collects river water samples and analyzes them for bacterial abundance, temperature, nutrients and carbon sources. Results to date show that BGE decreases with increased bacterial abundance, increases as the temperature rises to 25°C (77°F), and drops as the temperature goes above that. Dr. Roland will be testing the other parameters in the coming months.

In his pre-visit correspondence with IES scientists, Dr. Roland explained that he

would like to learn techniques he could use to improve microbial ecology research in Brazil, where he has a limited budget. In response, Dr. Cole developed methods that require little in the way of expensive supplies and scientific instruments. Dr. Roland will be able to use these methods in the mountain streams of Juiz De Fora Province, in coastal lagoons and at Lake Batata in the Brazilian Amazon.

Dr. Roland's work in Brazil also includes teaching ecology to undergraduate and graduate students at the university as well as to primary and secondary school teachers. While at the Institute, he is developing ways to integrate teaching and research, both to give his students a more complete understanding of the concepts of ecology and to collect data for his own research in aquatic ecology. He will be working with IES ecology educators to learn about techniques developed and practiced here that turn the out-of-doors into a classroom.

Dr. Likens' Sabbatical, *from page 1*

The Likens also worked together on a forest study in northern Wisconsin. The forest under investigation had been cut and burned about 100 years ago and Dr. Likens is interested to learn more about ecosystem recovery there. Measurements included abundance, density and basal area of all tree species. These data, along with those collected in 1950, 1960, 1970 and 1980 by forest ecologist Dr. Forest Stearns, now retired from the University of Wisconsin, Milwaukee, are being analyzed and will be published.

In November, Dr. Likens took a short break from his research and flew to Canberra, Australia. There, as a member of a small review committee, he evaluated the progress of the Cooperative Research Centre for Freshwater Ecology. "This is considered one of the top of the [more than 70] Cooperative Research Centres in Australia," said Dr. Likens upon his return. "It has an excellent program, focused on producing the greatest public good from freshwater ecosystems."

While in Australia, Dr. Likens—who was awarded The Australia Prize* in 1994—was invited to brief the Minister for the Environment, Senator the Honorable Robert Hill, at a dinner at Parliament House. To an audience comprising senators, heads of state and federal agencies and an environmental group, he spoke on sustainable forestry. This is a

"hot issue" in Australia, due to the many forest areas that are being cleared for wood chips used to produce paper and other wood products in Japan.

On the way home, the Likens stopped at the University of Southern California in Los Angeles where Dr. Likens participated in the dedication of the new Tyler Environmental Prize Pavilion. The Tyler Prize for Environmental Achievement, widely considered the "Nobel Prize for ecology", is widely recognized as the most prestigious environmental award in the world. Dr. Likens and Dr. F. Herbert Bormann won the 1993 Tyler Prize in recognition of their pioneering ecological research at HBES; other laureates have included Mr. G. Evelyn Hutchinson, Dr. C. Everett Koop, Dr. Eugene Odum, Dr. Ruth Patrick and Dr. Sherwood Rowland. The new pavilion honors these and the other 31 scientists who have been awarded the Tyler Prize since its inception in 1974. Following the dedication, Dr. Likens spoke on "The Acid Rain Dilemma: Now and In the Future", at a conference on

International Environmental Science, Policy and Security in the 21st Century.

Dr. Likens' goals for his sabbatical were to focus on his research and reserve time to think, write and interact with colleagues. The seven months were full and rewarding, and he returned to IES satisfied that he had met these goals.

While Dr. Likens was on sabbatical, Institute of Ecosystem Studies Scientist Dr. Michael Pace served as acting director, dividing his time between administrative responsibilities at IES and his research on lake ecosystems.

IES Visitors

The early spring snowstorm brought down trees and branches across the Mary Flagler Cary Arboretum.

The IES grounds crew is clearing the internal roadways first, and then will begin work on the trails. The Wappinger Creek and Cary Pines trails will be closed until they are free of debris and all "widow-makers" are removed from overhead. The greenhouse and perennial garden are open as usual, with a free permit from the Visitor Center. Call 914/677-5359 for an update on the status of the trails.

* *The Australia Prize is an international award, sponsored annually by the Australian Government, in recognition of outstanding achievement in science and technology promoting human welfare. Dr. Likens was awarded the prize for his work in the field of sustainable land management.*

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CONTINUING EDUCATION

For a Spring 1997 catalogue and program information, call the Continuing Education office at 914/677-9643. Programs during May and June include:

Gardening

May 18: Spring Wildflower Identification
June 21: Designing a Perennial Border for All Seasons - Section A

June 28: Designing a Perennial Border for All Seasons - Section B

June 28: Simply Roses

Natural Science Illustration

May 12-17 (daily; call for hours): Pen & Ink II
Biology and Earth Science

May 17: Mosses & Liverworts: Bryophytes in the Field

May 31: Ethnobotany of Eastern Woodland Indians

June 7: Wonderful Weeds: Knowing and Using the Common Plants of Your Schoolyard Workshops

May 10: New Cutting-Edge Perennials

May 15: Wetland Creation and Restoration: A Hands-on Experience

Excursions and Tours

Some of the May and June trips are filled. At press time, the following still had openings:
May 30-31: Mt. Cuba, Winterthur and Bowman's Hill

May 31: Shawangunks and Ancient Ice Caves

June 14: Bartlett and Highstead Arboreta

June 21: Mohonk Mountain House, Gardens, Lake and History

June 28: Caprilands Herb Farm

* The Summer 1997 Continuing Education Program catalogue will be available in early June.

SUNDAY ECOLOGY PROGRAMS

Free public programs are held on the first Sunday of the month. In May, there will be a program on the third Sunday as well.

Call 914/677-5359 to confirm the day's topic or, in case of poor weather, to learn the status of the day's program.

* We recommend that participants wear long pants tucked into socks and sturdy waterproof shoes for all outdoor programs.

Sunday Ecology Programs, continued:
May 4: Fish or No Fish: What It Means for Other Aquatic Organisms in Ponds, led by IES Research Assistant Dave Thomas
May 18: Super Soil: The World Beneath Our Feet, led by IES research assistant Alan Lorifice
June 1: Exotic Pests and Forest Health, led by IES Plant Ecologist Dr. Gary Lovett

IES SEMINARS

Free scientific seminars are held each Friday through early May, at 3:30 p.m. at the IES Auditorium:

April 18: Are Continental Shelves "Black Holes" for Nitrogen. Dr. Sybil Seitzinger, Inst. of Marine and Coastal Sciences, Rutgers University

April 25: Spatial Projections of Potential Habitat and Populations of the Gray Wolf and Implications for Overall Forest Productivity. Dr. David J. Mladenoff, Department of Forestry, University of Wisconsin

May 2: Are You Mad as a Hatter? The Environmental Chemistry of Mercury. Dr. Charles T. Driscoll, Dept. of Civil and Environmental Engineering, Syracuse University

* The seminar series will resume in September.

VOLUNTEER OPPORTUNITIES

Volunteers are needed in the IES Ecology Shop, Education Program and Continuing Education Program offices, library, Perennial Garden and Fern Glen. For information on volunteering at IES, call Ms. Su Marcy at 914/677-5359.

IES ECOLOGY SHOP

New in the Shop ... New York maple syrup ... glass vases in all shapes and colors ... IES photo notecards ... for children ... new animal finger puppets ... and in the Plant Room ... flowering plants ... EZ-diggers ... knee pads ... bird houses
Spring Plant Sale: May 16 and 17 from 10 a.m. - 4 p.m. and May 18 from 11 a.m. - 4 p.m.
Senior Citizens Days: 10% off on Wednesdays
** Gift Certificates are available **

GREENHOUSE

The IES greenhouse is open until 3:30 p.m. daily except public holidays. Admission is by free permit (see "HOURS").

HOURS

Winter hours: October 1 - April 30
Closed on public holidays.

Public attractions are open Mon. - Sat, 9 a.m.- 4 p.m. & Sun. 1-4 p.m., with a free permit*. The IES Ecology Shop is open Mon.- Fri, 11a.m.- 4 p.m., Sat. 9 a.m.-4 p.m. & Sun. 1-4 p.m. (The shop is closed weekdays from 1-1:30 p.m.)

Summer hours begin May 1.

* Free permits are required for visitors and are available at the IES Ecology Shop or the Education Program office daily until 3 p.m. (4 p.m. after May 1).

MEMBERSHIP

Join the Institute of Ecosystem Studies. Benefits include subscription to the newsletter, member's rate for courses and excursions, a 10% discount on IES Ecology Shop purchases, and participation in a reciprocal admissions program. Individual membership: \$30; family membership: \$40. Call Ms. Janice Clairborne at 677-5343.

The Institute's Aldo Leopold Society
In addition to receiving the benefits listed above, members of The Aldo Leopold Society are invited guests at spring and fall IES science updates. Call Ms. Jan Mittan at 677-5343.

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